

Broadband Electrically Tunable Monolithic Mid-Infrared Laser

Completed Technology Project (2013 - 2016)



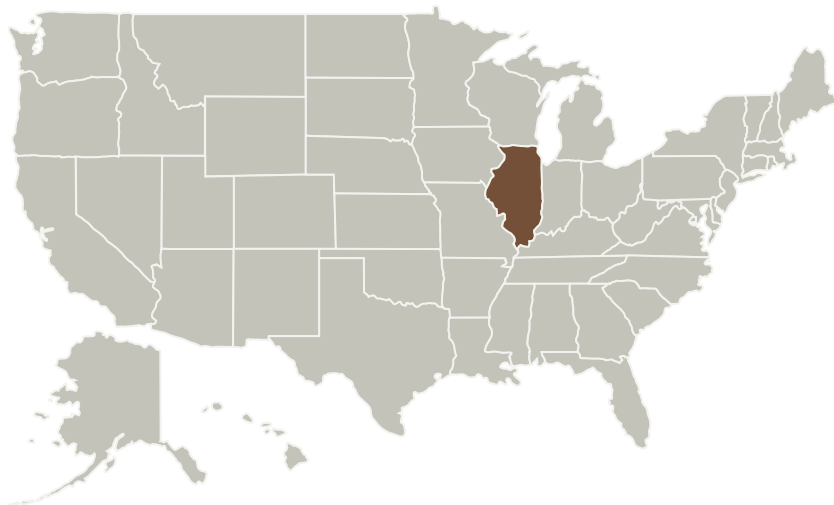
Project Introduction

Mid-Infrared spectroscopy is an invaluable tool for chemical detection and identification. While single frequency lasers have been used previously for single chemical detection in NASA missions, a broadly tunable laser offers the possibility to detect a large number of chemicals with a single source. This is invaluable for providing maximum functionality in a limited footprint. Current broadly tunable mid-infrared laser systems utilize one or more laser gain chips and mechanical external cavity tuning in order to span a wide spectral range. This technique is sensitive to mechanical shock and has a limited tuning speed. Our goal is to replace these systems with a compact source that is electrically tunable and mechanically robust. This is a potentially transformative technology that will dramatically improve both SWaP and reliability for future NASA missions. The main goal will be accomplished via three main research tracks: 1) Engineering a broadband gain medium based on quantum cascade laser technology; 2) Development of a multi-section, electrically tunable laser design for the mid-infrared; 3) On-chip beam combining and amplification for high power and excellent beam quality.

Anticipated Benefits

Our goal is to replace current broadly tunable mid-infrared laser systems with a compact source that is electrically tunable and mechanically robust. This is a potentially transformative technology that will dramatically improve both SWaP and reliability for future NASA missions.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission
Directorate (STMD)

Responsible Program:

Space Technology Research
Grants

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Organizations Performing Work	Role	Type	Location
Northeastern University(NEU)	Supporting Organization	Academia	Boston, Massachusetts

Primary U.S. Work Locations

Illinois

Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

Project Management

Program Director:

Claudia M Meyer

Program Manager:

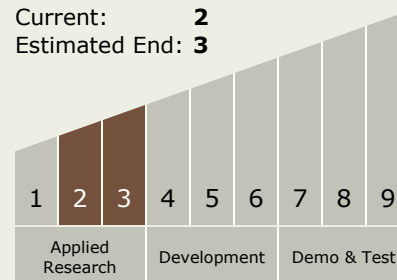
Hung D Nguyen

Principal Investigator:

Manijeh Razeghi

Technology Maturity (TRL)

Start: 2
Current: 2
Estimated End: 3



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - TX08.1 Remote Sensing Instruments/Sensors
 - TX08.1.5 Lasers